

WHAT IS CLAIMED IS:

- 5 ~~Sub C1~~ 1. A system for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising (i) a liquid carrier, (ii) at least one oxidizing agent, (iii) at least one polishing additive that increases the rate at which the system polishes at least one layer of the substrate, (iv) at least one stopping compound with a polishing selectivity of the first metal layer:second layer of at least about 30:1, wherein the stopping compound is a cationically charged nitrogen containing compound selected from compounds comprising amines, imines, amides, imides, and mixtures thereof, and (v) a polishing pad and/or an abrasive.
- 10 2. The system of claim 1, wherein the liquid carrier is a nonaqueous solvent.
- 15 3. The system of claim 1, wherein the liquid carrier is water.
- 20 4. The system of claim 3, wherein the system comprises an abrasive suspended in the liquid carrier.
- 20 5. The system of claim 3, wherein the abrasive is fixed on the polishing pad.
- 25 ~~Sub C2~~ 6. The system of claim 3, wherein no abrasive is present in the system, and the polishing pad is a non-abrasive pad.
- 30 7. The system of claim 3, wherein at least one stopping compound is selected from compounds comprising primary amines, secondary amines, tertiary amines, quaternary amines, etheramines, oligomeric amines, oligomeric imines, oligomeric amides, oligomeric imides, polymeric amines, polymeric imines, polymeric amides, polymeric imides, and mixtures thereof.
- 35 8. The system of claim 3, wherein at least one stopping compound is selected from the group consisting of amino acids, amino alcohols, amino ether alcohols, and mixtures thereof.
- ~~Sub A10~~ 9. The system of claim 7, wherein at least one stopping compound is selected from the group consisting of a polyetheramine, polyethylenimine,

5

$E^0 A_{10}$ 10

0 **9** **8** **7** **6** **5** **4**

15

20

25

30

35

poly-carboxylic acids, pyrophosphates, tri-phosphates, condensed phosphates, di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, and mixtures thereof.

17. The system of claim 16, wherein the system comprises at least one
5 stopping compound comprising two or more primary amine groups and at least one
polishing additive selected from the group consisting of di-carboxylic acids, tri-
carboxylic acids, poly-carboxylic acids, pyrophosphates, tri-phosphates, condensed
phosphates, di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, and
mixtures thereof.

10

18. The system of claim 17, wherein at least one stopping compound
comprises two or more primary amine groups and at least one polishing additive is
selected from the group consisting of di-carboxylic acids, tri-carboxylic acids, poly-
carboxylic acids, and mixtures thereof.

15

19. The system of claim 18, wherein at least one oxidizing agent is a
peroxide, and wherein the system further comprises at least one passivation film
forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing
rings.

20

20. The system of claim 17, wherein at least one stopping compound
comprises two or more primary amine groups and at least one polishing additive is
selected from the group consisting of di-phosphonic acids, tri-phosphonic acids, poly-
phosphonic acids, and mixtures thereof.

25

21. The system of claim 20, wherein at least one oxidizing agent is a
peroxide, and wherein the system further comprises at least one passivation film
forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing
rings.

30

22. The system of claim 16, wherein at least one stopping compound has a
molecular weight greater than about 100.

23. The system of claim 16, wherein at least one stopping compound
comprises an amino propyl group.

SUB A >
" 35

24. The system of claim 16, wherein at least one stopping compound comprises three or more carbon atoms.

25. The system of claim 3, wherein the system comprises a peroxide, aminotri(methylenephosphonic acid), and 1, 4-bis(3-amino propyl) piperazine.

26. The system of claim 3, wherein the system comprises a peroxide, tartaric acid, and a polyethylenimine.

10 27. The system of claim 3, wherein the system further comprises at least one polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.

28. The system of claim 3, wherein the system further comprises at least one
15 passivation film forming agent.

29. The system of claim 3, wherein the abrasive is a metal oxide abrasive.

30. The system of claim 29, wherein the abrasive is selected from the group
20 consisting of alumina, ceria, germania, silica, titania, zirconia, and coformed products
thereof, and mixtures thereof.

31. The system of claim 30, wherein the abrasive is alumina.

25 32. A method of polishing a substrate comprising contacting a surface of a
substrate with the system of claim 1 and polishing at least a portion of the substrate
therewith.

33. A method for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising the steps of:

30 (a) contacting the first metal layer with the system of claim 1, and

(b) polishing the first metal layer with the system until at least a portion of the first metal layer is removed from the substrate.

35 34. A method of polishing a substrate comprising contacting a surface of a
substrate with the system of claim 3 and polishing at least a portion of the substrate
therewith.

35. A method for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising the steps of:

- 5 (a) contacting the first metal layer with the system of claim 3, and
(b) polishing the first metal layer with the system until at least a portion of the first metal layer is removed from the substrate.

36. A composition for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising (i) liquid carrier, (ii) at least one oxidizing agent, (iii) at least one polishing additive that increases the rate at which the system polishes at least one layer of the substrate, and (iv) at least one stopping compound with a polishing selectivity of the first metal layer:second layer of at least about 30:1, wherein the stopping compound is a cationically charged nitrogen containing compound selected from compounds comprising amines, imines, amides, imides, and mixtures thereof, to be used with (v) a polishing pad and/or an abrasive.

37. The composition of claim 36, wherein at least one stopping compound comprises a polyethylenimine and at least one polishing additive is selected from the group consisting of di-carboxylic acids, tri-carboxylic acids, poly-carboxylic acids, pyrophosphates, tri-phosphates, condensed phosphates, di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, and mixtures thereof.

38. The composition of claim 36, wherein at least one stopping compound comprises two or more amine groups and at least one polishing additive is selected from the group consisting of di-carboxylic acids, tri-carboxylic acids, poly-carboxylic acids, pyrophosphates, tri-phosphates, condensed phosphates, di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, and mixtures thereof.

39. The composition of claim 38, wherein at least one stopping compound comprises two or more primary amine groups and at least one polishing additive is selected from the group consisting of di-carboxylic acids, tri-carboxylic acids, poly-carboxylic acids, pyrophosphates, tri-phosphates, condensed phosphates, di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, and mixtures thereof.

40. The composition of claim 39, wherein at least one stopping compound comprises two or more primary amine groups and at least one polishing additive is

09636245-081000

selected from the group consisting of di-carboxylic acids, tri-carboxylic acids, polycarboxylic acids, and mixtures thereof.

41. The composition of claim 39, wherein at least one stopping compound
5 comprises two or more primary amine groups and at least one polishing additive is
selected from the group consisting of di-phosphonic acids, tri-phosphonic acids, poly-
phosphonic acids, and mixtures thereof.

42. The composition of claim 38, wherein at least one stopping compound has a molecular weight greater than about 100.

43. The composition of claim 38, wherein at least one stopping compound comprises an amino propyl group.

15 44. The composition of claim 38, wherein at least one oxidizing agent is a peroxide, and wherein the system further comprises at least one passivation film forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing rings.

SUB A, 3